

Working paper

# Connecting the red corridor

Infrastructure  
development in  
conflict zones

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# Connecting the Red Corridor: infrastructure development in conflict zones

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## Abstract

We introduce a unique, integrated dataset on Maoist activity, three flagship programmes for rural infrastructure development (PMGSY, RGGVY, and USOF), and a dedicated programme targeted at India's Left Wing Extremism (LWE) regions. Our data reveals that Maoist affected villages were not targeted differentially for the flagship programmes, but did attract more Integrated Action Plan (IAP) projects. The relationship between Maoist activity (at the village or district level) and programme performance appears to be complex. Regression results are partially in line with a large body of qualitative evidence on the importance of disruption. Nevertheless, we note some cases in which programme completion is faster (USOF) or appears to be cheaper (PMGSY and IAP) in Maoist affected areas.

## 1 General Intro

Unprecedented investment in infrastructure was at the heart of the Government of India's strategy to bring economic development to India's rural population. These development efforts gain particular importance in the 90-odd districts that are affected by Left Wing Extremism (LWE). The affected regions are among India's poorest, they are characterised

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by a large share of scheduled tribes, and they suffer from severe gaps in rural infrastructure provision, as highlighted by a recent Planning Commission report (2008). In this context, understanding the ingredients of successful infrastructure development and its relationship with the conflict is particularly important. While the Centre’s flagship programmes did not target Naxalite areas in particular, the selection criteria implied that the efforts were particularly intense in the Red corridor. At the same time, the provision of infrastructure to regions affected by an insurgency brings with it particular challenges, and the disruption of flagship schemes by the Maoist movement has received regular coverage in the press.

In this document, we will first discuss the existing literature on infrastructure development and conflict. We will subsequently describe the particular challenges for infrastructure development in the Maoist belt on the basis of press reports. Then, we will introduce a village-level dataset on infrastructure development and a newly collected dataset about violent incidents in India’s areas affected by Left Wing Extremism (LWE).

## **2 Literature on infrastructure development and conflict**

Academic work has highlighted the underdevelopment of the Red Corridor Banerjee and Saha (2010), Borooah (2008). And negative agricultural income shocks have been found to spur Maoist violence against civilians (e.g. Eynde (2015) ), suggesting that the relationship may be a causal one. An implication of that finding is that efforts to spur economic development in the Red Corridor would reduce violence over the longer run.

While recent academic contributions shed light on the dynamics of violence and could help policy makers to understand the context in which they operate, they do not explicitly study the impact of government policies or the quality of government policy execution in these regions. Evidence from the Philippines suggests that the impacts are not necessarily positive: Crost, Felter, and Johnston (2014) find that eligibility for a development fund led to an intensification of violence, which they interpret as evidence of rebels strategically trying to stop projects that will turn the population against them.

Three recent papers investigate the relationship between development programming and conflict by examining the effects of NREGA on India’s Naxalite conflict. First, Khanna

and Zimmermann (2014) report similar findings to those in the Philippines: they argue that the introduction of NREGA has actually boosted Naxalite violence. These authors compare violence outcomes in districts that are on the margin of being selected or not in the different phases of NREGA. The mechanism through which NREGA could intensify the conflict is through the increased polarization of the civilian population between government and Maoist supporters. Based on village-level evidence, Pasquale (2014) offers an alternative interpretation: poor implementation of rural infrastructure programs could upset the local population and play in the cards of the Maoist movement.

The argument that NREGA increased Maoist violence goes against the findings of both Fetzer (2014) and Gawande, Kapur, and Satyanath (2015). These researchers argue that NREGA has in fact reduced violent conflict. While Fetzer (2014) focuses on political violence across India, Gawande, Kapur, and Satyanath (2015) confirm this finding for the Maoist conflict in particular. In both cases, the methodology adopted is a difference-in-difference approach, in which sets of districts in the different implementation phases of NREGA are compared before and after the introduction of the programme (as in Imbert and Papp (2015)). They also show that NREGA reduces the sensitivity of violence to rainfall shocks.

These finding that NREGA reduces violence in the Maoist affected districts is consistent with the work of Banerjee and Saha (2010). These authors report survey findings from Bastar that suggest that the Maoists do generally allow NREGS work to take place (although they consistently attempt to block road construction). Importantly, Gawande, Kapur, and Satyanath (2015) highlight that the positive effects of NREGA are more pronounced in well-performing states. This heterogeneity in impacts can account for the contradictory findings on the impact of NREGA by different research teams: each methodology requires a specific sample, and causal impacts across samples may be different. In general, more research is needed to understand these sources of heterogeneity better and reconcile the evidence on the conflict-mitigating impact of NREGA.

It seems fair to conclude that much has yet to be learned about how development programmes affect violence in Maoist-affected regions of India. The wider economic literature has so far identified one context in which local development efforts were effective: based on evidence from Iraq, Berman, Shapiro, and Felter (2011) finds that small-scale development

projects that were implemented directly by the US Army helped to reduce violence. It goes without saying that the insurgency in Iraq is very different from Indian Maoism. Yet, if the recipe for successful development in conflict zones is one in which projects are small-scale, flexible, responsive to local needs, and implemented by or in close co-operation with local security forces, it is worth pointing out that some of most ambitious development projects undertaken in rural India (as part of the Bharat Nirman Programme) are large-scale and offer limited flexibility. One exception to this rule is the recently adopted Integrated Action Plan, under which smaller scale infrastructure programmes are carried out at the initiative of the district collector (the senior administrative official at the district level, also sometimes known as the district magistrate).<sup>1</sup> Hence, the village-level dataset collected for this project may help to address important questions regarding the use of development programs to combat political violence in India's Maoist belt.

### **3 Challenges of infrastructure development in the Maoist belt**

India has four major infrastructure development programs that operate in the Maoist belt:

1. Universal Service Obligation Fund (USOF) which aims to expand rural telecommunications access by subsidizing tower construction and coverage;
2. Rajiv Gandhi Grameen Vidyutikaran Yojna (RGGVY) which is extending electrical infrastructure to small villages and supporting local generation capacity where required;
3. Pradhan Mantri Gram Sadak Yojana (PMGSY) which provides funds to build all-weather roads linking remote villages to the country's main roads; and
4. the Integrated Action Plan (IAP) which initially provided development funds for administrators to spend on focused development projects in 60 heavily Maoist-affected districts.

This section summarizes these programmes and describes qualitatively how they interact with the Maoist conflict.

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<sup>1</sup>It is interesting to note that relevant programmes are typically implemented at the district level (for obvious administrative reasons), but that within district inequalities could be very relevant for the conflict environment (as highlighted by the discussion social characteristics).

### **3.1 Mobile telecom (USOF)**

#### **3.1.1 Programme description**

Under the Universal Service Obligation Fund (USOF), commercial providers received subsidies to build telecom towers in uncovered locations. The programme was launched in 2007, and 7,353 telecom towers were built by the end of 2011 under USOF phase I. Villages were targeted based on population size, and only uncovered village clusters of more than 2,000 inhabitants were eligible. 11,049 towers were proposed for phase II, relying on the same allocation rule but with relaxed population thresholds.

#### **3.1.2 Interaction with the Maoist conflict**

The concept of providing tele-connectivity (mobile, internet etc) in insurgent affected areas has always been seen through apprehensive eyes by security agencies. Their concern is that mobile infrastructure will help insurgents in carrying out their activities in a more coordinated way.<sup>2</sup>

There is, however, substantial evidence that security forces could benefit from mobile phone coverage. Tracking insurgents through their mobile communication apparently helped security forces target Maoist leader Kishenji in 2013.<sup>3</sup> And recent evidence from Iraq suggests that the installation of cellular towers can lead to reduced violence in high intensity conflicts by making it easier for civilians to share information on insurgent activities (Shapiro and Wiedmann 2015). Indeed, the violent opposition of Maoist groups against mobile telecom development suggests that the balance of costs and benefits tilts indeed in favour of the security forces.<sup>4</sup> Naxalites attacked 38 towers in 2008, 66 in 2009, 70 in 2010, and 71 in 2011.<sup>5</sup> Blowing up of towers, snapping the cables, setting ablaze the battery/generator rooms, damaging the control rooms or threatening villagers not to give their land for construction of towers, are among the techniques used to disrupt telecommunications infrastructure.

Mobile Infrastructure Sharing Scheme, under USOF, is not an exclusive scheme for LWE areas. But, with its focus on villages that were uncovered by existing mobile telecom infras-

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<sup>2</sup>This is a common concern. It led Thai authorities to restrict access to SIM cards in parts of Southern Thailand in 2005, for example.

<sup>3</sup>tehelka.com, 30 May 2013, "Is Delhi trying to repeat its Kashmir experience in Naxal-hit States?"

<sup>4</sup>The Telegraph, 20 Jun 2011, "Hi-fi mobile towers to fight Maoists."

<sup>5</sup>tehelka.com, 30 May 2013, "Is Delhi trying to repeat its Kashmir experience in Naxal-hit States?"

structure in 2006, USOF did necessarily include LWE affected areas. In its next phase (which is not part of our project), USOF will focus even more explicitly on conflict zones. Recently, the government has approved the scheme of setting up mobile towers in LWE areas with increased allocated fund (518 million dollars; rupees 32billion). Most of the mobile towers would be set up in secured locations like police stations or camps of security forces as a protective measure from extremists. Further to avoid interruption of electricity supply, solar energy will be used to keep running the towers.<sup>6</sup> The Government has relaxed green norms under Forest Conservation Act, whereby, now for the execution of public utility projects up to 5 hectares of land can be diverted.<sup>7</sup>

Given the particular focus of USOF's second phase on LWE areas, our study allows for a timely evaluation of the relationship between infrastructure development and mobile telecom coverage on the basis unique village level data of USOF's first phase.

## **3.2 Electrification (RGGVY)**

### **3.2.1 Programme description**

The RGGVY (Rajiv Gandhi Grameen Vidyutikaran Yojana) programme was launched in 2005 with the aim to connect un-electrified villages to the electrical grid. After the 10th plan, which focused on Northern states, the goal of RGGVY was broadened to support "intensive electrification" of already electrified villages. In the first phase, 102,627 unelectrified villages were connected to the grid between 2005 and 2012. Eligibility for RGGVY was based on the criterion that less than 10% of the population had access to electricity, although certain states used population thresholds.

### **3.2.2 Interaction with the Maoist conflict**

Rural electrification is not perceived as a direct threat to Maoist groups, and hence RGGVY has not faced the same opposition from Maoists as other infrastructure development programmes. In Malkangiri district which is a hotbed of Maoist violence in Orissa, for example, progress on RGGVY has been quite steady, albeit within guidelines issues by local Nax-

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<sup>6</sup> The Hindu, 24 Aug 2014, "2200 solar mobile towers to be set up in Naxal-affected areas."

<sup>7</sup> dna, 6 Sep 2014, "Government relaxes green norms in Maoist-affected areas."

alites.<sup>8</sup> Similarly, the West Bengal district of West Medinipur, which is severely affected by Maoist activity, is considered one of the better performing districts for the programme.<sup>9</sup> There are even reports of Maoists attempting to force the state to speed up electrification. This was the case in Balimela district in Odisha state, where Maoists threatened to blow up a hydro-electricity project if power supply was not provided to the non-electrified villages.<sup>10</sup>

There is, however, some contrary evidence regarding the relationship between Naxal violence and RGGVY. In a few cases Maoists have tried preventing electricity reaching the villages under their control because it will make people aware of the benefits they are being deprived of.<sup>11</sup> Moreover, implementation of RGGVY suffered in many regions because of the general threat of violence, even if the threats were not directed against electrification in particular. Disruptions include strikes called by the Maoists (so-called *Bandhs*), poor transportation options (bad roads and limiting movement to daylight hours), counter-insurgent operations hampering movement of material and personnel to construction sites, and illegal demands for money from contracting agencies seeking extra remuneration for working in Naxal areas. Press reports also suggest that the implementation of RGGVY has suffered because local officials were unwilling to travel to target villages that were in Naxal-affected regions,<sup>12</sup> and outside workers are generally unwilling to work in these areas.<sup>13</sup> Threats of violence have also led some companies from Latehar, Daltanganj and Garwah districts of Jharkhand to stop participating in the rural electrification programme.<sup>14</sup>

### **3.3 Road construction (PMSGY)**

#### **3.3.1 Programme description**

Pradhan Mantri Gram Sadak Yojana (PMGSY) is the Central Government's flagship program for rural road construction. Under PMGSY, 349,178 km of roads have been built between 2001 and 2013. The programme, which funds construction of all-weather roads connecting previously unconnected habitations to the country's backbone road network, was

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<sup>8</sup>The Indian Express, 7 Jan 2010, "Maoists issues do's and don'ts to contractors."

<sup>9</sup>The Hindu, 7 Aug 2010, "Bengal slow in rural electrification."

<sup>10</sup>The Hindu, 19 June 2009, "Maoist threaten to blow up Balimela hydro-electricity project"

<sup>11</sup>Seminar, 03 May 2012, "Left Wing Extremism: Meeting the Challenge."

<sup>12</sup>Livemint, Feb 24 2009, "Rural Electrification drive slows in some states due to Maoist fear."

<sup>13</sup>41st Standing Committee Report on Energy.

<sup>14</sup>Business Standard, 19 Dec 2013, "Maoist threat hindering electrification: Jharkhand Minister."



launched in 2000. Eligibility is based on population thresholds in combination with prioritization rules based on the rank of the village by population in a given district. So far, we have collected implementation details on 103,281 roads (totaling 349,178 km) completed between 2001 and 2013.

### **3.3.2 Interaction with the Maoist conflict**

Roads have obvious benefits for security services in the view of many Indian government leaders. Jairam Ramesh, then Minister of Rural Development argued in 2013 that the construction of roads is the “single most important developmental intervention in Naxal-affected areas.”<sup>15</sup> And a large share of unconnected habitations falls into the Left Wing Extremist (LWE) areas, both now and at the start of the programme. Of the 52,000 habitations in the 82 maoist affected districts, 30,000 have been sanctioned, but only 19,000 were connected through February 2013<sup>16</sup>

Maoists have opposed construction of roads in remote areas since they believe roads will make it easier for security forces to conduct anti-Maoist operations. There have been a large number incidents of Maoists burning machinery used for road construction.<sup>17</sup>

Possibly in an attempt to gain local support for their opposition to PMGSY, the Maoists have denounced the reliance of the scheme on contractors who are not obliged to hire local workers. One of the posters left behind at these sites reads “When labourers are migrating to other states in search of work, executing road and bridge works using machines serves no purpose.”<sup>18</sup> Opposition to automation is a common theme Maoists use to oppose road projects.<sup>19</sup> Contractors also regularly face extortion demands. In June 2012, contractors were warned of dire consequences if they went ahead with the work by the so-called members of Balangir-Bargarh-Mahasammund divisional committee.<sup>20</sup>

In the light of these challenges, some flexibility has been introduced in PMGSY from 2013 onwards. The process of building the roads is broken into two stages: Stage A and Stage B. Stage A includes construction of formation, construction of gravel-base, slope stabilization,

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<sup>15</sup>News24, 13 January 2013, “Tribal centric development to tackle Maoist menace: Ramesh’.

<sup>16</sup>PIB, 5 February 2013, “Centre approves multi-connectivity under PMGSY in Naxal affected districts.”

<sup>17</sup>The Hindu, 24 December 2013, “Maoists raid construction firm camp in Laxmipur.”

<sup>18</sup>IBN, 1 June 2012, “Maoists strike again, burn down three tractors.”

<sup>19</sup>See, for example, WebIndia123, 21 January 2011, “Maoists set ablaze JCP Machine.”

<sup>20</sup>IANS, 8 April 2014, “Maoists torch construction machinery in Odisha.”

protection works and drainage works. Stage B includes bituminous or concrete surfacing. As Maoists are thought to oppose blacktopping, habitations can now be declared “connected” at the end of stage A. Moreover, multiple road connectivity in the same village can now be approved under PMGSY for LWE areas. These changes are critical from a security perspective as police forces want to have multiple ways to travel to any given village, both to avoid potential ambushes and to make sure that they have multiple options for relieving rural police stations that come under attack.

In order to ensure contractor participation, the central government also announced to fully compensate any destruction of equipment or any injury of labourers.<sup>21</sup> In spite of these measures, the state government of Chhattisgarh only recently expressed its inability to attract contractors for more than 200 sanctioned road projects under PMGSY due to the Maoist threat.<sup>22</sup>

### **3.4 Integrated Action Plan (IAP)**

#### **3.4.1 Programme description**

The Integrated Action Plan (IAP) stands out because it is focused on Maoist affected districts has extremely flexible implementation criteria compared to the flagship nation-wide programmes discussed above. In September 2009 the Prime Minister Manmohan Singh declared that the Maoists were gaining consensus among civilians, tribal and rural people in particular. The Naxalite presence was becoming more and more rooted in the poorest regions of the country, where the lack of economic development could easily convert into absence of confidence for the public institutions. “Dealing with left-wing extremism,” said the Prime Minister, “requires a nuanced strategy, a holistic approach. It cannot be treated simply as a law and order problem.”<sup>23</sup>

The Integrated Action Plan (IAP) was launched in 2009 following this spirit. Originally the program targeted 60 heavily-affected districts in 10 Naxalite-affected states. The programme was since been expanded to 26 additional districts under the Twelfth Five Year Plan in 2012. The official intent was to boost economic development and trust in the

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<sup>21</sup>Mint, 6 February 2013, “Ramesh announces steps for construction of roads in Maoist regions.”

<sup>22</sup>The Pioneer, 15 May 2014, “Maoist terror blocking rural road works.”

<sup>23</sup>BBC News, 15 September 2009, “India is losing Maoist Battle.”

governmental institutions by providing additional funding assistance for grass-root development projects in Naxal-affected areas.<sup>24</sup> Tacitly the programme was also seen as a way to help the state establish better control over Naxal-affected territories by giving local police and district magistrates funds to use on targeted projects that would earn local good will. The Programme guidelines, in fact, require at least 65 percent of the funds provided by the Government to be spent in the most deprived and Left-Wing extremism-affected areas.<sup>25</sup>

By giving development funds directly to officials charged with managing Maoist violence the program me resembles the U.S. government’s Commander’s Emergency Response Program (CERP) which was shown to have substantially reduced insurgent violence in Iraq (Berman, Shapiro, and Felter 2011).

### **3.4.2 Interaction with the Maoist conflict**

Anecdotally IAP registered early successes in reducing Maoist violence. In December 2011, the National Government reported that the number of Naxalite related deaths and injuries had sharply reduced by nearly 50% from 2010 levels.<sup>26</sup> Some states, such as Madhya Pradesh, attributed their success to the IAP funds for rural development.<sup>27</sup> In 2012 the Home Minister P. Chidambaram claimed the success of the IAP in “bridging the development deficit and trust deficit in LWE affected areas.”<sup>28</sup> The same positive opinion was also expressed by many influential newspapers<sup>29</sup> Moreover, according to DNA News, “the CPI (Maoist) leader in their internal communication have described the IAP scheme as a stumbling block in the spread of their ideology and have even asked their academic comrades to undertake a study of its impact in their strongholds and how to counter it.”<sup>30</sup>

Not all scholars agree with this assessment. In an editorial on the Hindustan Times,

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<sup>24</sup>Press Information Bureau, Government of India, January 10, 2012, “Integrated Action Plan to Develop Tribal and backward Districts in LWE Areas.”

<sup>25</sup>Planning Commission, About Additional Central Assistance (ACA) for Left Wing Extremism (LWE) Affected Districts and Integrated Action Plan (IAP), no date, <http://iapmis.planningcommission.nic.in/SIAP/login.aspx>.

<sup>26</sup>The Hindu (Chennai, India), 25 November 2011, “Kishenji’s death a serious blow to Maoist movement.”

<sup>27</sup>Alert News Service, 1 January 2012, “Positive change in Naxal-hit areas in MP.”

<sup>28</sup>DNA News, 9 May 2012, “Integrated Action Plan for Maoist hit districts, a success: Government.”

<sup>29</sup>See e.g.: The Hindu, 9 May 2012, “Integrated Action Plan for Naxal-hit districts a success: Chidambaram”; Security-Risks.com, 5 December 2012, “Security Trends South Asia Naxalism Success of Integrated Action Plan in Naxal Areas”; and The Economic Times, 9 September 2014, “Home Ministry mulls wresting control over Integrated Action Plan, key anti-naxal development scheme”.

<sup>30</sup>DNA India, 1 April 2015, “Key development scheme that kept Maoists at bay faces termination.”

for example, Delhi University sociology professor Nandini Sundar expresses serious concerns about the efficacy of the Integrated Action Plan in gravely Naxal-infested villages. According to her sources, in many cases money are only spent on paper as village-level authorities don't live on site and monitoring is made impossible by the frequent kidnapping of officials in charge of this task.<sup>31</sup>

The Maoists have never claimed any of their attacks were a direct response to the IAP Program. Rather, they accuse the government of continuing to neglect tribal and rural areas while conducting sporadic attacks on development contractors. The violence acts as a deterrent for contractors to accept to work in Naxal areas. And the threat is not limited to contractors, but affects Government officials as well. The district collector of Malkangiri was kidnapped along with an engineer while returning from a visit to monitor a rural electrification project.<sup>32</sup> As noted by Nandini Sundar, these episodes threaten the possibility of an effective monitoring over the projects realization, an issue that primarily damages rural areas residents.<sup>33</sup> Finally, in a series of interviews conducted as part of our current project, district officials in Jharkhand indicated that Maoist attacks on infrastructure were an important cause of poor IAP implementation in their area. These officials noted that, in some cases, projects were moved to locations that has a weaker Maoist presence to enable their implementation. This mechanism could keep IAP from reaching its core target areas.

### **3.5 Infrastructure development in the red corridor: areas for research**

The wealth of qualitative reports in the Indian press about the relationship between Maoist activity and infrastructure development illustrates the fact that this topic is at the heart of the policy debate in India. These reports suggest a number of stylized facts:

- Maoists are directly disrupting the roll-out of certain types of infrastructure, e.g. roads and telecommunications, but not others, e.g. village level electrifications and small-scale IAP projects. Direct disruption thus appears to be motivated by the security force benefits certain types of infrastructure can offer.

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<sup>31</sup>Hindustan Times, 23 April 2012, "Take a different route"

<sup>32</sup>The Economic Times, 17 February 2011, "Krishan along with junior engineer Pabitra Majhi."

<sup>33</sup>Hindustan Times, 23 April 2012, "Take a different route."

- Maoist activity has an indirect effect of the roll-out of projects through general security concerns, even if infrastructure development is not targeted as such.
- The Maoists attempt to justify their opposition by referring to concerns of the local population about the quality of implementation (for electrification) or local work opportunities (PMGSY).
- Maoists are regularly reported to extort money from contractors, which suggests a willingness to allow for infrastructure development in return for other benefits.
- Maoist activity could have delayed, stopped, or diverted infrastructure development and there are two pathways for this: reduced willingness of contractors to enter areas or reluctance by government officials to travel to certain sites.
- The impact of each of these programmes and their contribution to the observed reduction in Maoist violence after 2012 is debated.

We believe each of these stylized facts deserves careful investigation. Our project attempts to contribute to this effort by developing a village level dataset of Maoist activity and infrastructure development. By integrating event data on Maoist violence with project-level data on all four major development programmes we hope to better understand the impact of projects on Maoist violence as well as assessing potential differences and complementarities between them. Of particular interest is a comparison of IAP, a flexible programme run at a relatively local level, as opposed to the three flagship programmes with set criteria. The gradual relaxation of certain criteria within these programmes (e.g. for PMGSY) offers further opportunities to identify the potential costs of rigidity in conflict zones.

## 4 Data

This section outlines our data on violence and infrastructure provision.

### 4.1 Data sources

As the backbone for our analysis we use the 2001 census villages. Data on RGGVY roll-out and implementation was collected from the Rural Electrification Corporation (Delhi). The

total number of unique projects taken up was 360,475, of which 96.34% could be matched at the 2001 census village. The dataset contains both extensive and intensive projects. Out of the extensive projects, virtually all villages (98.79%) are listed as having been energized. For PMGSY, we use administrative records of the NRRDA. Out of 103,856 completed roads with habitation information for completed roads,<sup>34</sup> we could match 77% to a 2001 census village using a fuzzy matching algorithm. The key source for the habitation to village mapping is a list of habitations maintained by NRRDA. Lists of villages covered under USOF towers and tower locations comes from the Centre for Development of Telematics (CDOT), the technical consultant of USOF. With a combination on matching on census codes and names, we matched 85% of covered villages to the census and 91% of villages categorized uncovered under proposed USOF towers and existing infrastructure. In line with the focus of the current paper on LWE affected regions, we restrict the sample subsequently to 10 Maoist affected states.<sup>35</sup> The imprecise assignment of Maoist incidents to villages with duplicate names in a given district requires us to restrict the sample further. Still, due to the large area covered by the 10 selected states, we maintain a sample of around 357,000 villages.

We match data on infrastructure and violence to these backbone data.

#### 4.1.1 Infrastructure data

As noted above we collected data on four major infrastructure programs:

- Lists of villages covered under USOF towers and tower locations comes from the Centre for Development of Telematics (CDOT), the technical consultant of USOF. With a combination on matching on census codes and names, we matched 85% of covered villages to the census and 91% of villages categorized uncovered under proposed USOF towers and existing infrastructure.
- Data on RGGVY roll-out and implementation was collected from the Rural Electrification Corporation (Delhi). The total number of unique projects taken up was 360,475, of which 96.34% could be matched at the 2001 census village. The dataset contains both

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<sup>34</sup>A separate set of 15,991 projects do not mention any connected habitations. We are still working to assign these roads to census villages based on road name or the destination habitation from a theoretical plan for rural road connectivity (the so-called "core network").

<sup>35</sup>Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Karnataka, Odhisha, Madhya Pradesh, Maharashtra, Uttar Pradesh, West Bengal

extensive and intensive projects. Out of the extensive projects, virtually all villages (98.79%) are listed as having been energized.

- For PMGSY, we use administrative records of the NRRDA. Out of 103,856 completed roads with habitation information for completed roads,<sup>36</sup> we could match 77% to a 2001 census village using a fuzzy matching algorithm. The key source for the habitation to village mapping is a list of habitations maintained by NRRDA.
- For IAP we collected data on 6 districts with particularly complete data: Bastar (including its recently carved out districts), Kawardha, and Koriya in Chhattisgarh; Karimnagar in Andhra Pradesh; and Puruliya and Bankura in West Bengal.

Full descriptions of these data can be found in the accompanying report "Mapping Rural Infrastructure Development in India".

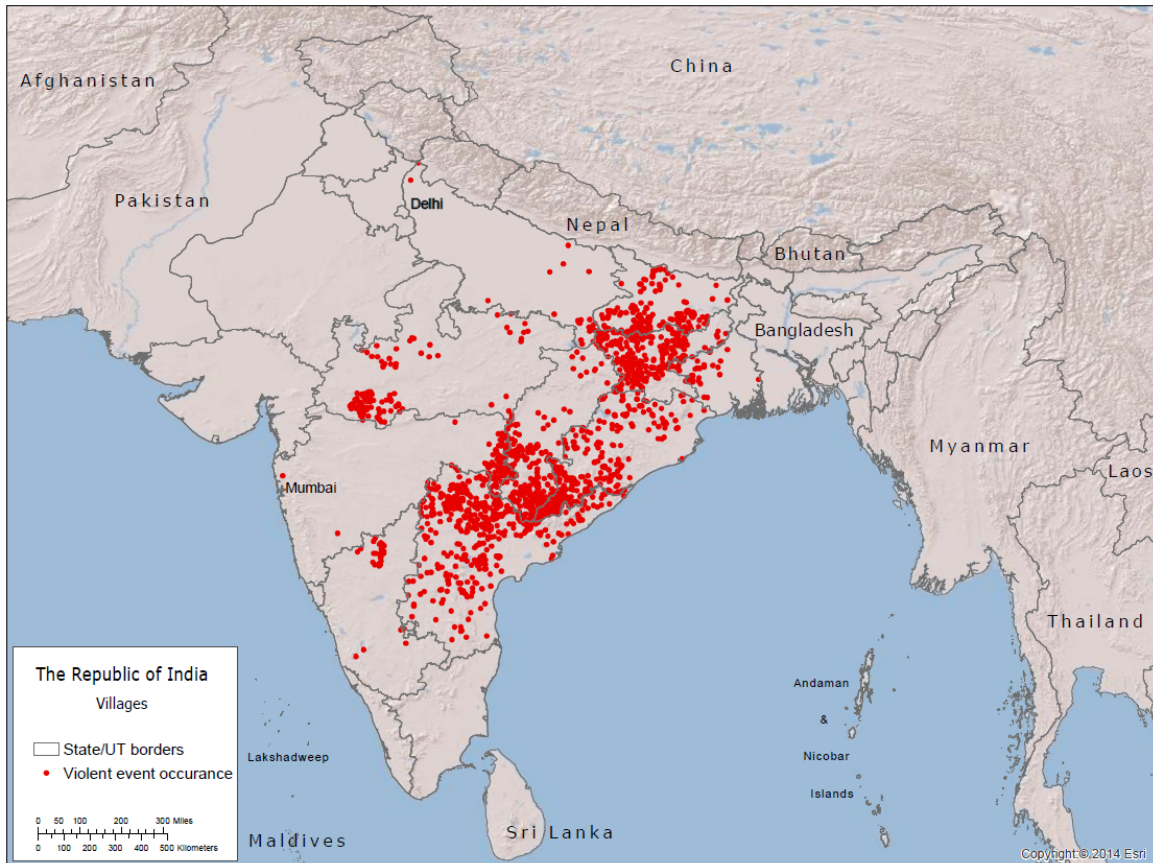
#### 4.1.2 Violence data

The raw source data are paragraph-length summaries of political and conflict events in India compiled by the South Asia Terrorism Portal. These data are publicly available and were collected using python-based, web-scraping tools. After the source data was collected, a coding interface was developed in Amazon's mechanical turk (mTurk) platform and Google Forms. The interface contains a number of questions, described below, regarding pieces of critical information that are commonly present in the event summaries. After all events were coded, we identified events for which important geographic data was missing. In particular, not all summaries reference the exact village where an encounter took place. When non-village geographic references were present (for example, a forest or police station), coders were asked to estimate the location of the event using all available information. The current data represent the most precisely identified collection of Maoist-related activities collected to date. As the processing of this data is an ongoing effort, this paper focuses on a subset of villages for which we could reliably assign incidents to locations: these are the villages that have unique names in their district. This dataset consists of 4,059 geo-coded events.

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<sup>36</sup>A separate set of 15,991 projects do not mention any connected habitations. We are still working to assign these roads to census villages based on road name or the destination habitation from a theoretical plan for rural road connectivity (the so-called "core network").

Figure 1:



Maoist Violence by District

Figure 1 map our data on violence. It highlights those villages that experience Maoist violence in red. The clustering of violence in the Red Corridor is obvious.

## 4.2 Descriptive statistics

Table 1 describes our data set at the village level. The summary statistics confirm the geographical spread of the conflict. Around 50% of villages are in districts with at least one Maoist related incident. 14% are in districts with at least 25 incidents. Still, recorded incidents at the district level are relatively rare. A bit less than 1% of villages (2,929) were characterised by at least one occurrence of a LWE related incident. The summary statistics also confirm the impressive scale of the three flagship programmes, which were set to cover 18% of village with electricity, 19% with rural roads, and around 30% with mobile telecom infrastructure through USOF.



Table 1: Summary statistics (village level)

Variable	N	mean	median	sd
<b>Maoist Events</b>				
Number violent events	357,777	0.005	0.000	0.087
Number violent events in district	357,777	0.005	0.000	0.069
Any violent events in district	357,777	0.391	0.000	0.488
More than 25 events in district	357,777	0.137	0.000	0.344
Between 1 and 25 events in district	357,777	0.362	0.000	0.481
Any event in village	357,777	0.008	0.000	0.090
Any event in district	357,777	0.499	0.000	0.500
<b>USOF</b>				
Village covered by proposed tower	357,777	0.321	0.000	0.467
Number of USOF towers proposed in village	357,777	0.013	0.000	0.112
Number of actual USOF towers in village	357,777	0.012	0.000	0.109
Mean deviation (km) from proposed tower	3,818	5.298	4.213	4.798
Mean days to completion for proposed tower	3,620	768.939	781.000	186.672
Cancelled proposed tower	4,559	0.163	0.000	0.369
<b>RGVY</b>				
Number of Extensive Projects	357,777	0.183	0.000	0.387
Number of Intensive Project	357,777	0.350	0.000	0.477
Implementation Period for Extensive Project	5,0574	4.698	4.622	1.909
Implementation Period for Intensive Project	114,886	4.181	4.266	1.836
<b>PMGSY</b>				
Share of habitations connected by PMGSY	357,777	0.190	0.000	0.376
Completion time (years)	53,259	3.737	3.439	9.670
Average cost per km (Lakh Rs)	59,518	26.393	24.447	95.590
Completion (dummy)	81,601	0.732	1.000	0.443
<b>Combined</b>				
Any three RGVY, PMGSY, or USOF	357,777	0.547	1.000	0.498
<b>Census 2001</b>				
Logarithm of population	330,064	6.557	6.671	1.227
Literacy Share	330,064	0.443	0.454	0.169
Share of ST	330,064	0.183	0.000	0.320
Share of SC	330,064	0.181	0.126	0.202
Logarithm of density	330,064	1.173	1.182	1.183
Phones p.c. in 2001	330,064	0.002	0.000	0.064
Power in 2001	330,064	0.734	1.000	0.442
Observations	357,777	0.048	0.000	0.214

*Notes:* Village level data from the 2001 census, PMGSY, USOF, and RGVY data matched at the level of the census village. When there are multiple projects in a village, the average at the village level is used for performance metrics. Projects are counted for USOF and RGVY, and for PMGSY the share of connected habitations is reported. The sample is restricted to villages with unique names in districts of 10 Maoist affected states.

Table 2 shows the distribution of infrastructure projects in our sample. This table suggests a mild focus of the Centrally funded flagship programmes on Maoist affected villages. The share of villages receiving any single or combination of projects is higher among Maoist affected villages than among those villages that did not qualify for the programme. Still, it is natural that these schemes focused on exactly the relatively poorly connected localities that suffer most from LWE related violence. Therefore, we will turn to a regression model to describe the relationship between Maoist activity and the roll-out of the programmes.

Table 2:  
**Infrastructure in Maoist affected villages**

	All villages	Any Maoist events
Any of the three programmes	197,074	1,700
USOF proposed coverage	113,876	992
USOF proposed tower	4,484	75
RGGVY Extensive Covered	64,916	577
PMGSY Connected	80,762	819
Number	354,848	2,929

*Notes:* Village level data from the 2001 census, PMGSY, USOF, and RGGVY data matched at the level of the census village. Completion time, deviation, and cost measures are conditional on completion.

## 5 Targeting and performance of Bharat Nirman in LWE areas

This section analyzes the relationship between roll-out measures at the village level and Maoist violence, both at the village and the district level. The estimating equation is as follows:

$$Y_{i,d,s} = \alpha_s + \beta \text{Maoist violence}_{i,d} + \gamma X_i + \epsilon_{i,d,s} \quad (1)$$

All outcomes  $Y$  are measured at the village level ( $i$ ) for a given district ( $d$ ) and state ( $s$ ). The violence measures will be defined either at the village level or at the district level. We include a set of key controls at the village level (summarized in  $X$ ): the logarithm of population, the share of the ST population, the share of the SC population, literacy, the logarithm of population density, the number of phones per capita in 2001, and a dummy for power supply in 2001.<sup>37</sup> Importantly, we include state fixed effects in our main specification,

<sup>37</sup>We do not control for the existence of a paved road to the village in 2001, as this variable is missing in

so that we only exploit within state variation. Standard errors will be clustered at the district level because district officials were responsible for both implementing development projects under BN and organizing police activity targeting leftwing extremism.

Table 3: **USOF**

	Proposed coverage	Proposed tower	Deviation (km)	Completion time (days)	Cancelled tower
	(1)	(2)	(3)	(4)	(5)
<b>Village level</b>					
Any Maoist events	-0.014 [0.018]	0.006 [0.004]	1.457 [1.059]	-27.939 [26.184]	0.061 [0.101]
$R^2$	0.0533	0.0171	0.0738	0.4328	0.0333
<b>District level</b>					
1-25 Maoist events	0.019 [0.021]	0.001 [0.001]	-0.269 [0.261]	-6.486 [15.488]	0.017 [0.023]
>25 Maoist events	0.016 [0.028]	0.002 [0.002]	-0.103 [0.387]	-74.439*** [21.996]	0.047 [0.052]
$R^2$	0.535	0.0171	0.0729	0.4463	0.0341
Observations	319,704	319,704	3,737	3,544	4,451
Number of clusters	309	309	300	289	302

*Notes:* Village level data from the 2001 census, PMGSY, USOF, and RGGVY data matched at the level of the census village. is restricted to villages with unique names in districts of 10 Maoist affected states. Regressions control for state FE, the log of population, the literacy share, the ST share, the SC share, log population density, phone connections per capity, and power supply in 2001. Standard errors are clustered at the district level and reported in brackets.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The first two columns of table 3 examine the extent to which being Maoist affected (at the village level in the upper panel, or the district level in the lower panel) is associated with the roll-out of USOF at the village level, after we have controlled for key determinants. We do not find any evidence that Maoist events make villages more or less likely to qualify for coverage or for a tower under USOF. Perhaps more surprisingly, these areas also do not experience higher delays or cancellations. If anything, the completion times are on average 72 days shorter in villages that experience any Maoist events.

The patterns for RGGVY (Table 4) are quite different from those of USOF: roll-out can be explained by violence at the district level, with the most violent districts attracting more extensive and less intensive projects (controlling for access to power supply in 2001).

a substantial number of villages. We confirmed that results are quantitatively similar when we restrict our sample and do control for road connectivity at baseline.

Table 4: **RGVY**

	Extensive project	Intensive project	Completion time extensive	Completion time intensive
	(1)	(2)	(3)	(4)
<b>Village level</b>				
Any Maoist events	-0.005 [0.012]	-0.040 [0.026]	0.248** [0.123]	0.118 [0.167]
$R^2$	0.3071	0.4192	0.5742	0.1733
<b>District level</b>				
1-25 Maoist events	0.006 [0.018]	-0.054 [0.034]	0.166 [0.220]	0.557** [0.256]
>25 Maoist events	0.065** [0.026]	-0.114*** [0.044]	0.549 [0.359]	0.734* [0.399]
$R^2$	0.3091	0.4233	0.5820	0.1301
Observations	319,704	319,704	48,546	113,407
Number of clusters	309	309	130	165

*Notes:* Village level data from the 2001 census, PMGSY, USOF, and RGVY data matched at the level of the census village. is restricted to villages with unique names in districts of 10 Maoist affected states. Regressions control for state FE, the log of population, the literacy share, the ST share, the SC share, log population density, phone connections per capity, and power supply in 2001. Standard errors are clustered at the district level and reported in brackets.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

On average, these projects appear to suffer longer delays in affected villages (for extensive projects) and in affected districts (for intensive projects).

For PMGSY (Table 5), we do not find any evidence of differential roll-out in Maoist affected localities, but performance metrics do appear to be affected. As for USOF, the results hold a surprise: average costs per km appear to be lower in Maoist affected areas. This result could be a consequence of selection: if only the easiest roads get sanctioned or completed in Maoist affected areas, the observed roads could be cheaper. Similarly, in the absence of quality monitoring, the quality of roads may be poorer in Maoist affected districts.<sup>38</sup> The table does not offer clear support for this interpretation. For the completion measure, we do indeed see that districts with severe levels of Maoist activity do worse, but the corresponding coefficient is marginally insignificant (p-value of 0.12). However, and in line with detailed contextual evidence discussed above, more violent districts and villages

<sup>38</sup>As described in the introduction to PMGSY, quality standards were lowered in Maoist affected areas. This only happened officially in 2013, implying that a tiny share of roads would be affected by the official policy change. Of course, it is possible that quality standards had already been reduced informally in Maoist affected localities.

Table 5: **PMGSY**

	Habitation share connected (1)	Completion time (2)	Cost per km (days) (3)	Completed road (4)
<b>Village level</b>				
Any Maoist events	-0.021 [0.016]	0.168* [0.095]	-0.059** [0.023]	-0.020 [0.022]
$R^2$	0.0816	0.0951	0.4928	0.4720
<b>District level</b>				
1-25 Maoist events	0.002 [0.012]	-0.046 [0.093]	-0.032 [0.026]	0.003 [0.015]
>25 Maoist events	0.009 [0.018]	0.312** [0.130]	-0.076** [0.034]	-0.036 [0.022]
$R^2$	0.0816	0.0981	0.4941	0.4726
Observations	319,704	52,080	58,164	79,321
Number of clusters	309	306	307	307

*Notes:* Village level data from the 2001 census, PMGSY, USOF, and RGGVY data matched at the level of the census village. is restricted to villages with unique names in districts of 10 Maoist affected states. Regressions control for state FE, the log of population, the literacy share, the ST share, the SC share, log population density, phone connections per capity, and power supply in 2001, and the sanction year of the project. Standard errors are clustered at the district level and reported in brackets. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

are characterized by longer completion times.

One consistent finding across programmes is that Maoist affected villages do not appear to have been targeted differently from other villages. Of course, future work will need to determine whether this pattern is causal, by using the timing and criteria of roll-out and violence. To some extent, we can confirm the qualitative evidence on the challenges of infrastructure provision in the red corridor. While there is clear evidence that Maoist affected localities suffer from disruptions and delays for RGGVY and PMGSY, there is also evidence of lower costs in PMGSY and faster completion for USOF in the same localities. Again, we cannot be certain of the causal relationship underlying these findings at this stage, but they point towards a complex relationship between law and order on the one hand and the conditions of project completion on the other hand.

Table 6: **Summary statistics (village level - IAP Sample)**

<b>Variable</b>	<b>N</b>	<b>mean</b>	<b>median</b>	<b>sd</b>
<b>Sample</b>				
IAP sample	0.075	0.000	0.264	
<b>Maoist Events</b>				
Any events in village	26,991	0.023	0.000	0.149
More than 25 events in district	26,991	0.531	1.000	0.499
Between 1 and 25 events in district	26,991	0.418	0.000	0.493
<b>IAP</b>				
Any IAP projects	26,991	0.168	0.000	0.374
Expenditures per project	4,542	5.517	3.500	7.618

*Notes:* Village level data from the 2001 census. The sample is restricted to villages with unique names in districts of 10 Maoist affected states. Event data and IAP data are reported for the "IAP sample" of districts with match rates higher than 70% for village-level IAP projects and at least one IAP project undertaken.

## 6 IAP

In this section, we analyse the roll-out of a programme that was specifically targeted at Maoist affected districts: IAP. As the village level information for IAP is only consistently available for a subset of districts, we restrict our IAP analysis to a smaller sample of 6 2001 districts with particularly complete data: Bastar (including its recently carved out districts), Kawardha, and Koriya (Chhattisgarh), Karimnagar (Andhra Pradesh), as well as Puruliya and Bankura (West Bengal).<sup>39</sup> Table 6 introduces the IAP dataset. On average, about 25% of villages hosted an IAP project. In this subsample, the violence measures naturally have higher means than those in the full sample (table6). The percentage of villages experiencing Maoist related incidents is around 2.5%. Due to the small number of districts in this section, we restrict attention to Maoist incidents at the village level.

In Table 7, we analyze the roll-out of IAP in the sample of 6 districts. Strikingly, and in contrast to the results for flagship programmes described above, IAP does appear to have been targeted at villages affected by Maoist activity. This pattern does not hold at the district level, which is consistent with the fact that all districts under IAP benefit from the same funding package. While we do not have good performance metrics for IAP, it is

<sup>39</sup>All have a match rate of projects at the village level above 70% and at least one matched IAP project in the district.

Table 7: **IAP**

	Any IAP projects (1)	Log(expenditure/project) (2)
<b>Village level</b>		
Any Maoist events	0.111*** [0.024]	-0.058 [0.147]
$R^2$	0.066	0.066
>25 Maoist events	0.059 [0.042]	-0.585*** [0.080]
$R^2$	0.069	0.087
Observations	24,792	3,821
Number of clusters	21	20

*Notes:* IAP data matched to 2001 census villages. The sample is restricted to 6 districts (described in text). Regressions control for state FE, the log of population, the literacy share, the ST share, the SC share, log population density, phone connections per capita and power supply in 2001. Standard errors are clustered at the district level.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

interesting to see that the cost per project is not higher in Maoist affected villages, and significantly lower in severely affected districts. While these results mirror the finding that PMGSY construction was cheaper in Maoist affected localities, it is important to keep in mind that the IAP was purposely targeted at LWE areas and so likely faced different selection pressures, making direct comparisons of fixed-effects regressions problematic.

## 7 Conclusion

We introduce a unique, integrated dataset on Maoist activity, three flagship programmes for rural infrastructure development (PMGSY, RGGVY, and USOF), and a dedicated programme targeted at India's LWE regions. Our data reveals that Maoist affected villages were not targeted differentially for the flagship programmes, but did attract more IAP projects. The relationship between Maoist activity (at the village or district level) and programme performance appears to be complex. Regression results are partially in line with a large body of qualitative evidence on the importance of disruption. Nevertheless, we note some cases in which programme completion is faster (USOF) or appears to be cheaper (PMGSY and IAP) in Maoist affected areas.

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